

CLAIMS

What is claimed is:

1. A separator comprising:

a vessel having a peripheral wall bounding a chamber, the vessel being rotatable about a rotational axis extending through the vessel, the chamber communicating with an inlet and a first outlet;

a plurality of fins disposed within the chamber;

a second tube extending from toward the rotational axis to toward the peripheral wall, the second tube having a first end in fluid communication with the exterior of the vessel and an opposing second end bounding a second outlet, the first outlet being disposed closer to the rotational axis than the second outlet such that during use a fluid boundary line can be formed between the first outlet and the second outlet; and

a first tube extending from toward the rotational axis to toward the peripheral wall, the first tube being coupled with a fluid source for selectively dispensing a fluid stream at or adjacent to the peripheral wall.

2. A separator as recited in claim 1, wherein one of the first tube and the second tube is disposed within the other.

3. A separator as recited in claim 1, wherein the first tube and the second tube are spaced apart.

4. A separator as recited in claim 1, wherein the first tube and the second tube are integrally formed.

5. A separator as recited in claim 1, wherein the first tube is aligned with or offset from the rotational axis.

6. A separator as recited in claim 1, wherein the first tube and the second tube combine to form an extraction tube, the separator further comprising a plurality of extraction tubes extending from toward the rotational axis to toward the peripheral wall.

7. A separator as recited in claim 1, wherein the second tube is also configured to withdraw fluid from the chamber of the vessel.

8. A separator as recited in claim 1, wherein the plurality of fins are spaced apart and extend from toward the rotational axis to toward the peripheral wall.

9. A separator as recited in claim 8, wherein each of the fins is disposed in a corresponding plane that is aligned with or offset from the rotational axis.

10. A separator as recited in claim 1, further comprising a first disc disposed within the chamber, the first disc outwardly projecting so as to intersect with each of the plurality of fins.

11. A separator as recited in claim 10, wherein the first disc radially outwardly projects in substantially perpendicular alignment with the rotational axis.

12. A separator as recited in claim 1, further comprising a plurality of perforations extending through the first disc.

13. A separator as recited in claim 1, wherein the first disc is disposed adjacent to the first tube.

14. A separator as recited in claim 1, further comprising a plurality of spaced apart discs disposed within the chamber, each disc radially outwardly projecting from toward the rotational axis to toward the peripheral wall so as to intersect with each of the plurality of fins.

15. A separator as recited in claim 1, wherein each of the plurality of fins has an outer edge, at least a portion of each outer edge being disposed adjacent to the peripheral wall so as to form a plurality of discrete flow channels.

16. A separator as recited in claim 15, further comprising:

the vessel having an equator with a maximum diameter encircling the rotational axis; and

a passage extending between at least two of the discrete flow channels at the equator.

17. A separator according to claim 1, wherein the chamber has a substantially spherical configuration or the configuration of a double truncated cone.

18. A separator as recited in claim 1, further comprising a pressure actuated valve regulating the flow of fluid exiting through the first outlet.

19. A separator as recited in claim 1, further comprising:

a first valve regulating the flow of fluid exiting through the first outlet;

a second valve regulating the flow of fluid exiting through the second outlet;

a first pressure sensor disposed to sense the fluid pressure upstream of the first valve; and

a second pressure sensor disposed to sense the fluid pressure upstream of the second valve.

20. A separator as recited in claim 19, wherein the first valve and the second valve are configured to maintain a pressure differential therebetween.

21. A separator as recited in claim 19, further comprising a controller in electrical communication with the first valve, the second valve, the first pressure sensor, and the second pressure sensor.

22. A separator as recited in claim 1, wherein the inlet is disposed at a first end of the vessel and the first outlet is disposed on an opposing second end of the vessel.

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23. A separator comprising:

a vessel having a peripheral wall bounding a chamber, the vessel being rotatable about a rotational axis extending through the vessel, the chamber communicating with an inlet and a first outlet;

a tubular member disposed within the chamber and communicating external thereof;

a plurality of fins disposed within the chamber, each of the fins extending from toward the tubular member to toward the peripheral wall; and

a first tube projecting from the tubular member to toward the peripheral wall, the first tube having a second outlet in communication with the chamber, the first outlet being disposed closer to the rotational axis than the second outlet such that during use a fluid boundary line can be formed between the first outlet and the second outlet.

24. A separator as recited in claim 23, wherein each of the plurality of fins is disposed in a corresponding plane that intersects with and is in longitudinal alignment with the tubular member.

25. A separator as recited in claim 23, further comprising a second tube extending from at least toward the tubular member to toward the peripheral wall, the second tube being coupled with a fluid source for selectively dispensing a fluid stream at or adjacent to the peripheral wall.

26. A separator as recited in claim 25, wherein one of the first tube and the second tube is disposed within the other.

27. A separator as recited in claim 25, wherein the first tube and the second tube are spaced apart.

28. A separator as recited in claim 25, wherein the first tube and the second tube are integrally formed.

29. A separator as recited in claim 23, wherein the first tube is aligned with or offset from the rotational axis.

30. A separator as recited in claim 25, wherein the first tube and the second tube combine to form an extraction tube, the separator further comprising a plurality of extraction tubes extending from toward the rotational axis to toward the peripheral wall.

31. A separator as recited in claim 25, wherein the second tube is also configured to withdraw fluid from the chamber of the vessel.

32. A separator as recited in claim 23, wherein each of the fins is disposed in a corresponding plane that is aligned with or offset from the rotational axis.

33. A separator as recited in claim 23, further comprising a first disc disposed within the chamber, the first disc outwardly projecting so as to intersect with each of the plurality of fins.

34. A separator as recited in claim 33, wherein the first disc radially outwardly projects in substantially perpendicular alignment with the rotational axis.

35. A separator as recited in claim 33, further comprising a plurality of perforations extending through the first disc.

36. A separator as recited in claim 23, wherein the first disc is disposed adjacent to the first tube.

37. A separator as recited in claim 23, further comprising a plurality of spaced apart discs disposed within the chamber, each disc radially outwardly projecting from toward the rotational axis to toward the peripheral wall so as to intersect with each of the plurality of fins.

38. A separator as recited in claim 23, wherein each of the plurality of fins has an outer edge, at least a portion of each outer edge being disposed adjacent to the peripheral wall so as to form a plurality of discrete flow channels.

39. A separator as recited in claim 38, further comprising:

the vessel having an equator with a maximum diameter encircling the rotational axis; and

a passage extending between at least two of the discrete flow channels at the equator.

40. A separator according to claim 23, wherein the chamber has a substantially spherical configuration or the configuration of a double truncated cone.

41. A separator as recited in claim 23, further comprising a pressure actuated valve regulating the flow of fluid exiting through the first outlet.

42. A separator as recited in claim 23, further comprising:

a first valve regulating the flow of fluid exiting through the first outlet;

a second valve regulating the flow of fluid exiting through the second outlet;

a first pressure sensor disposed to sense the fluid pressure upstream of the first valve; and

a second pressure sensor disposed to sense the fluid pressure upstream of the second valve.